

What is claimed is:

1. A method for controlling dimensions of structures formed on a substrate using an etch process, comprising:
  - providing the substrate having a patterned etch mask formed thereon;
  - measuring dimensions of elements of the mask on the substrate;
  - adjusting a process recipe for an etch process using the results of measuring said dimensions; and
  - forming the structures on the substrate performing the etch process that uses the adjusted process recipe.
2. The method of claim 1 wherein the substrate is a semiconductor wafer.
3. The method of claim 1 wherein the mask is a patterned hard etch mask or a patterned photoresist mask.
4. The method of claim 1 wherein the structures are formed in at least one material layer disposed beneath the mask.
5. The method of claim 1 wherein the dimensions are smallest widths of the elements.
6. The method of claim 1 wherein the dimensions are measured using a non-destructive measuring technique.
7. The method of claim 6 wherein the measuring technique is an optical measuring technique.
8. The method of claim 1 wherein the measuring step and the forming step are performed using processing modules of a single substrate processing system.

9. The method of claim 1 wherein the adjusting step comprises calculating an adjustment for the process recipe of the etch process.

10. The method of claim 9 wherein the adjustment is an adjustment for at least one parameter related to a thickness of a film of the material removed from sidewalls of the structures during the etch process.

11. The method of claim 10 wherein the at least one parameter is selected from a group consisting of a duration of time for overetching the structures, a flow rate and/or pressure of an etchant gas or gases, a plasma source power, a substrate bias power, a material of the structures and a thickness of sidewalls of the structures.

12. A method for controlling dimensions a gate structure of a field effect transistor formed on a substrate using an etch process, comprising:

providing the substrate having a patterned etch mask formed upon a film stack of the gate structure;

measuring dimensions of elements of the mask on the substrate;

adjusting a process recipe for an etch process of etching a layer of the film stack using the results of measuring said dimensions; and

forming the structures in the layer performing the etch process that uses the adjusted process recipe.

13. The method of claim 12 wherein the layer is selected from a group consisting of a gate conductor layer, a gate electrode layer, and a gate dielectric layer.

14. The method of claim 12 wherein the gate conductor layer comprises WSi, the gate electrode layer comprises doped polysilicon and the gate dielectric layer comprises SiO<sub>2</sub> or HfO<sub>2</sub>.

15. The method of claim 12 wherein the mask is a patterned hard etch mask or a patterned photoresist mask.

16. The method of claim 12 wherein the mask comprises a material selected from a group consisting of SiON, SiO<sub>2</sub>, Si<sub>3</sub>N<sub>4</sub>, HfO<sub>2</sub> and  $\alpha$ -carbon.

17. The method of claim 12 wherein the dimensions are smallest widths of the elements.

18. The method of claim 12 wherein the dimensions are measured using a non-destructive measuring technique.

19. The method of claim 18 wherein the measuring technique is an optical measuring technique.

20. The method of claim 12 wherein the measuring step and the forming step are performed using processing modules of a single substrate processing system.

21. The method of claim 12 wherein the adjusting step comprises calculating an adjustment for the process recipe of the etch process for etching the layer.

22. The method of claim 21 wherein the adjustment is an adjustment for at least one parameter related to a thickness of a film of the material removed from sidewalls of the layer during the etch process.

23. The method of claim 22 wherein the at least one parameter is selected from a group consisting of a duration of time for overetching the structures, a flow rate and/or pressure of an etchant gas or gases, a plasma source power, a substrate bias power, a material of the structures and a thickness of sidewalls of the structures.

24. A computer-readable medium containing software that when executed by a computer causes a semiconductor wafer processing system to control dimensions of structures formed on a substrate using an etch process, said medium using a method, comprising:

- providing the substrate having a patterned etch mask formed thereon;
- measuring dimensions of elements of the mask on the substrate;
- adjusting a process recipe for an etch process using the results of measuring said dimensions; and
- forming the structures on the substrate performing the etch process that uses

the adjusted process recipe.

25. The computer-readable medium of claim 24 wherein the measuring step and the forming step are performed using processing modules of a single substrate processing system.

26. The computer-readable medium of claim 24 wherein the adjusting step comprises calculating an adjustment for the process recipe of the etch process.

27. The computer-readable medium of claim 26 wherein the adjustment is an adjustment for at least one parameter related to a thickness of a film of the material removed from sidewalls of the structures during the etch process.

28. The computer-readable medium of claim 27 wherein the at least one parameter is selected from a group consisting of a duration of time for overetching the structures, a flow rate and/or pressure of an etchant gas or gases, a plasma source power, a substrate bias power, a material of the structures and a thickness of sidewalls of the structures.